# Monitoring soils using satellite images
# Products of the Soil Composite Mapping Processor (SCMaP)

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GIZ - Interactive Expert Brainstorming Session
28.04.2020

Introduction

# Optical EO for soil organic carbon monitoring – Potentials and Challenges

- Optical Earth Observation (EO) allow the estimation of soil organic carbon (SOC)
- SOC can only be estimated from the visible upper soil layer, soil depth measurement not possible with optical EO
- Operational soil monitoring system is currently requested by the European Space Agency – proposals in development
- Sensibility of operational SOC monitoring systems do not coincides with the reporting requirements of 1 year
- Soil moisture can be estimated by active and passive microwave technology, operational daily soil moisture product available at 0,25° grid cell size
- Requires special techniques for satellite image analyses (see following slides) to prepare a suitable data base

Loss of A and B horizons due to erosion in Spain

Introduction

# Soil Composite Mapping Processor (SCMaP) – Main Idea

Soil exposure vary over time (example RapidEye, 2012)

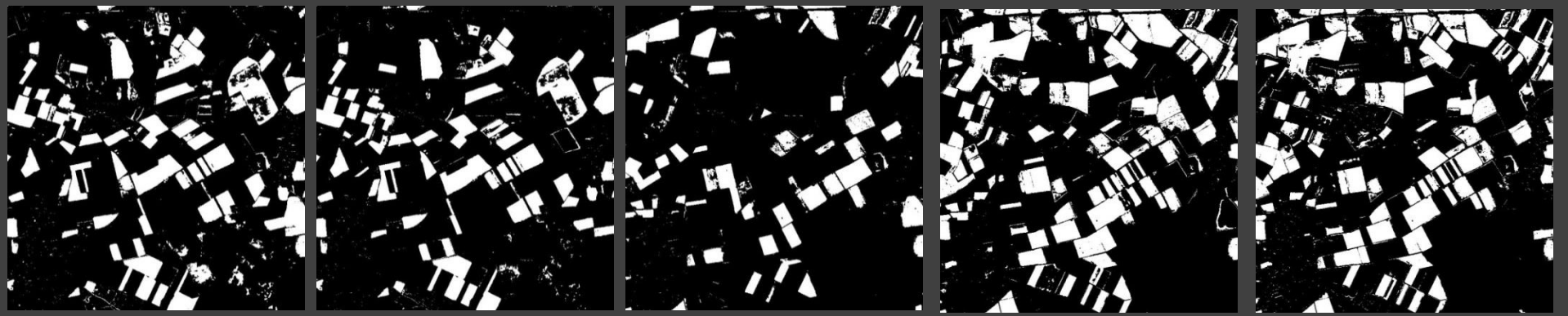
April
20.5 %

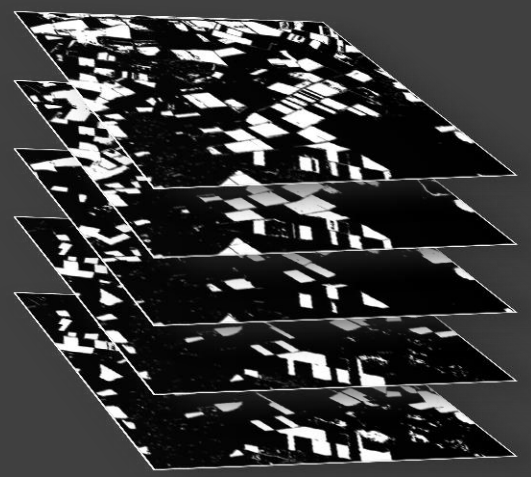
May
17.5 %

July
13.8 %

August
26.8 %

September
25.8 %





Expanding data base
Bare Soil Exposure = 47.9 %

SCMaP

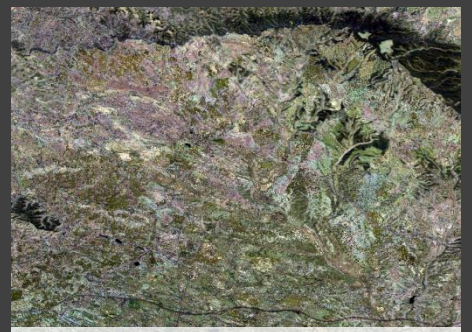
# Product suite for soil monitoring

**Soil Reflectance Composites**

**Additional Information on Land Cover Dynamics**

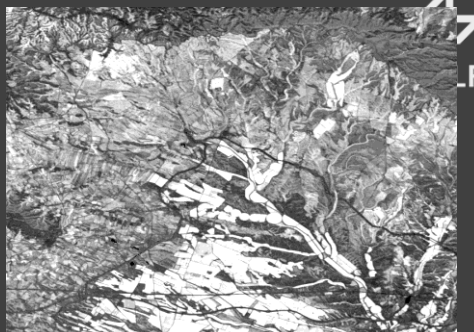
**Statistics**

Reflectance Comp. (Maximum Index)



Reflectance Comp. (Minimum Index)

Reflectance Comp. (Mean)

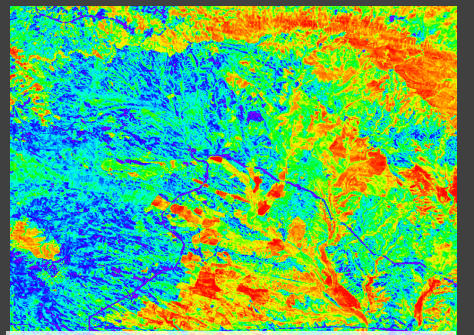


Index Composite (Stats)

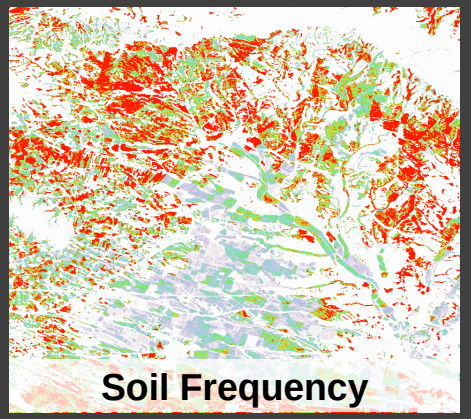
Soil Reflectance Composite

Soil Reflectance Composite (Normalised)

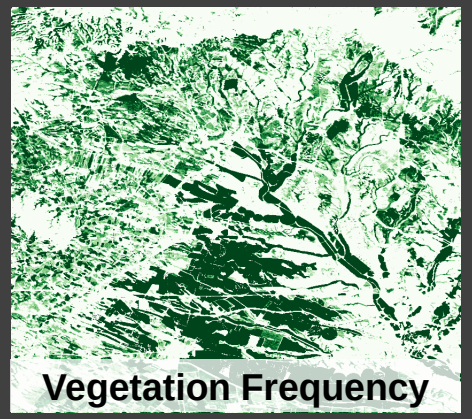
Mean Albedo



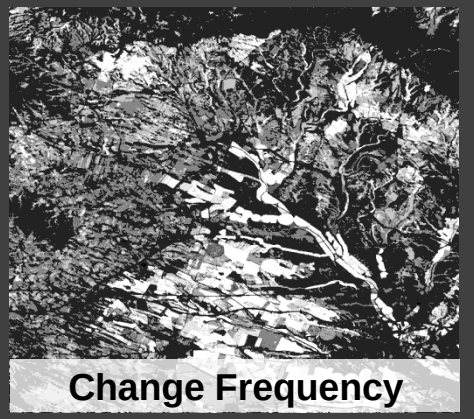
No. of Valid Inputs



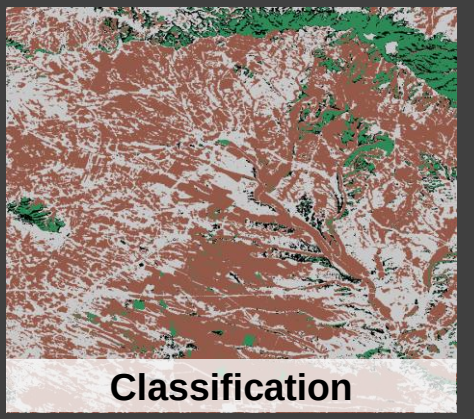
Soil Frequency



Vegetation Frequency



Change Frequency



Classification

SCMaP

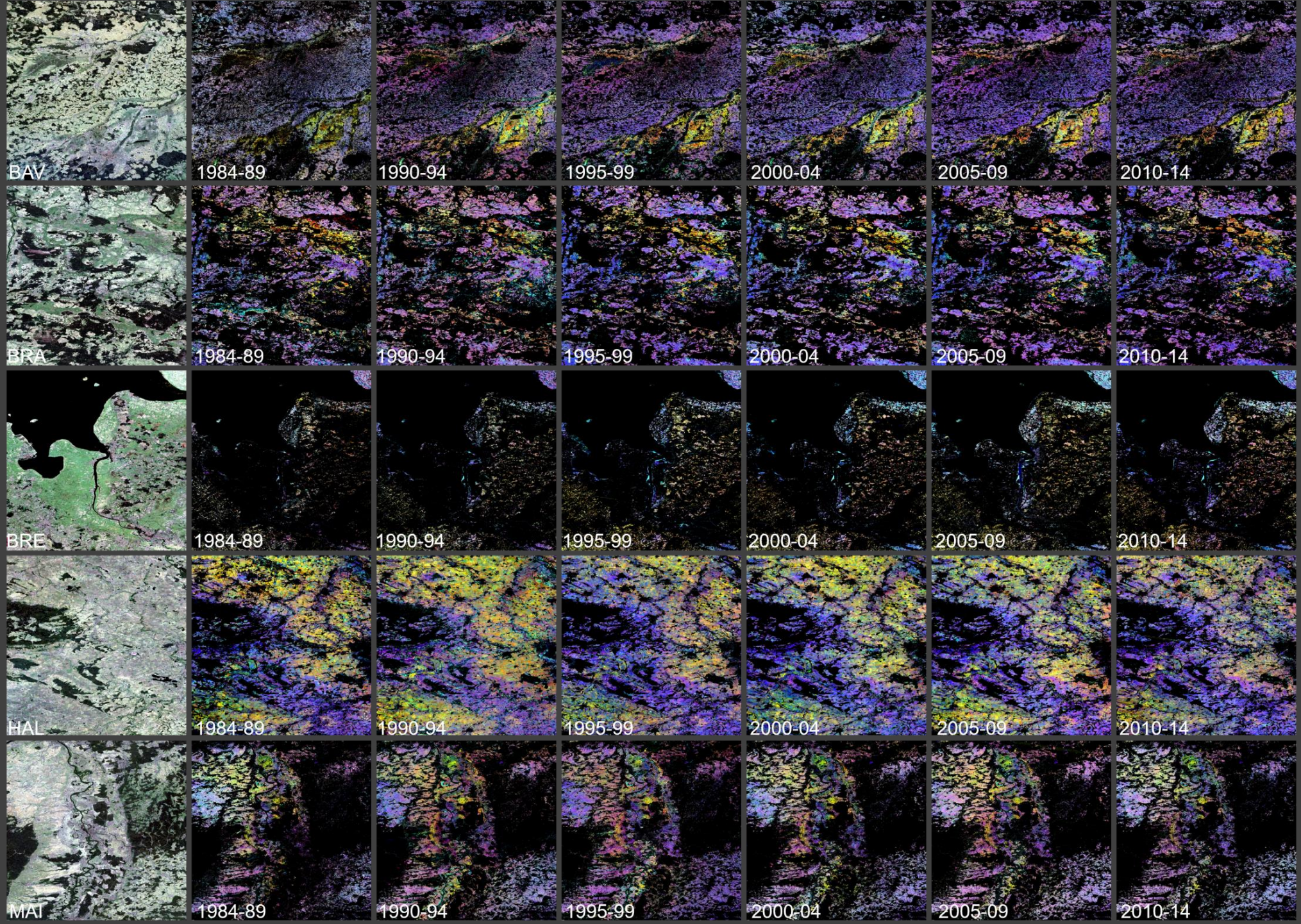
# Product suite for soil monitoring

**Soil Reflectance Composites**

**Additional Information on Land Cover Dynamics**

**Statistics**

**Products available for different time periods**



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# Product suite for soil monitoring

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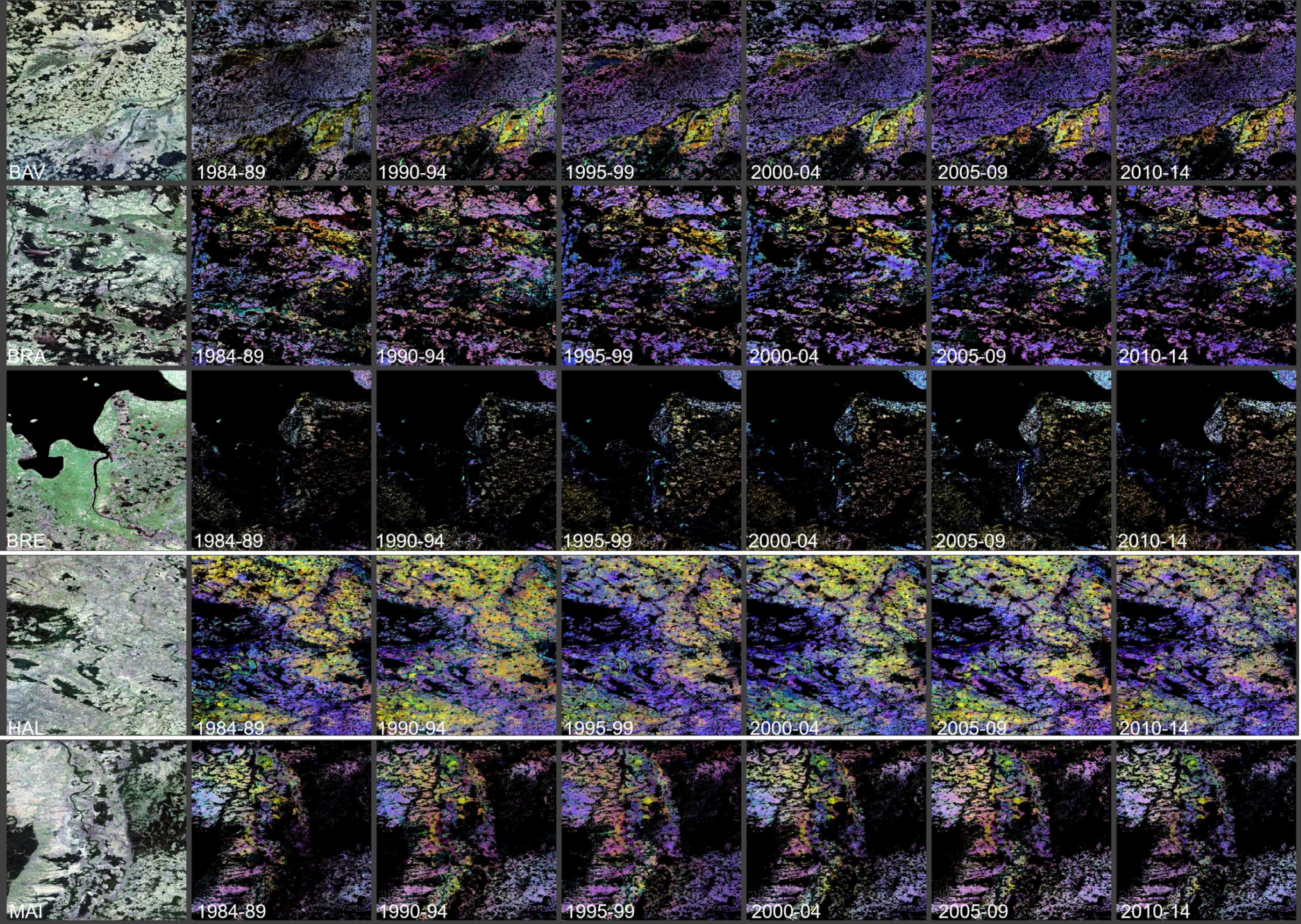

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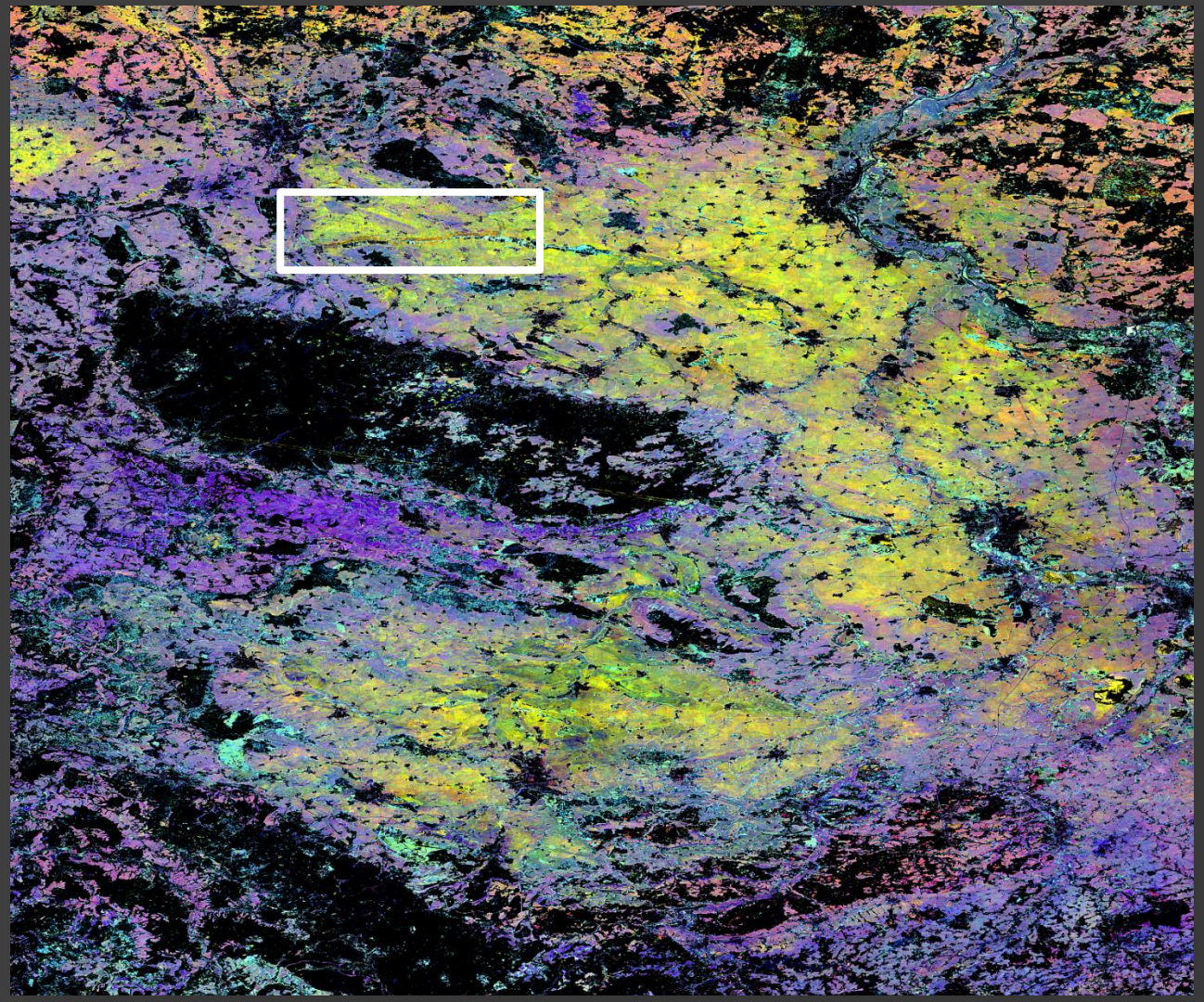
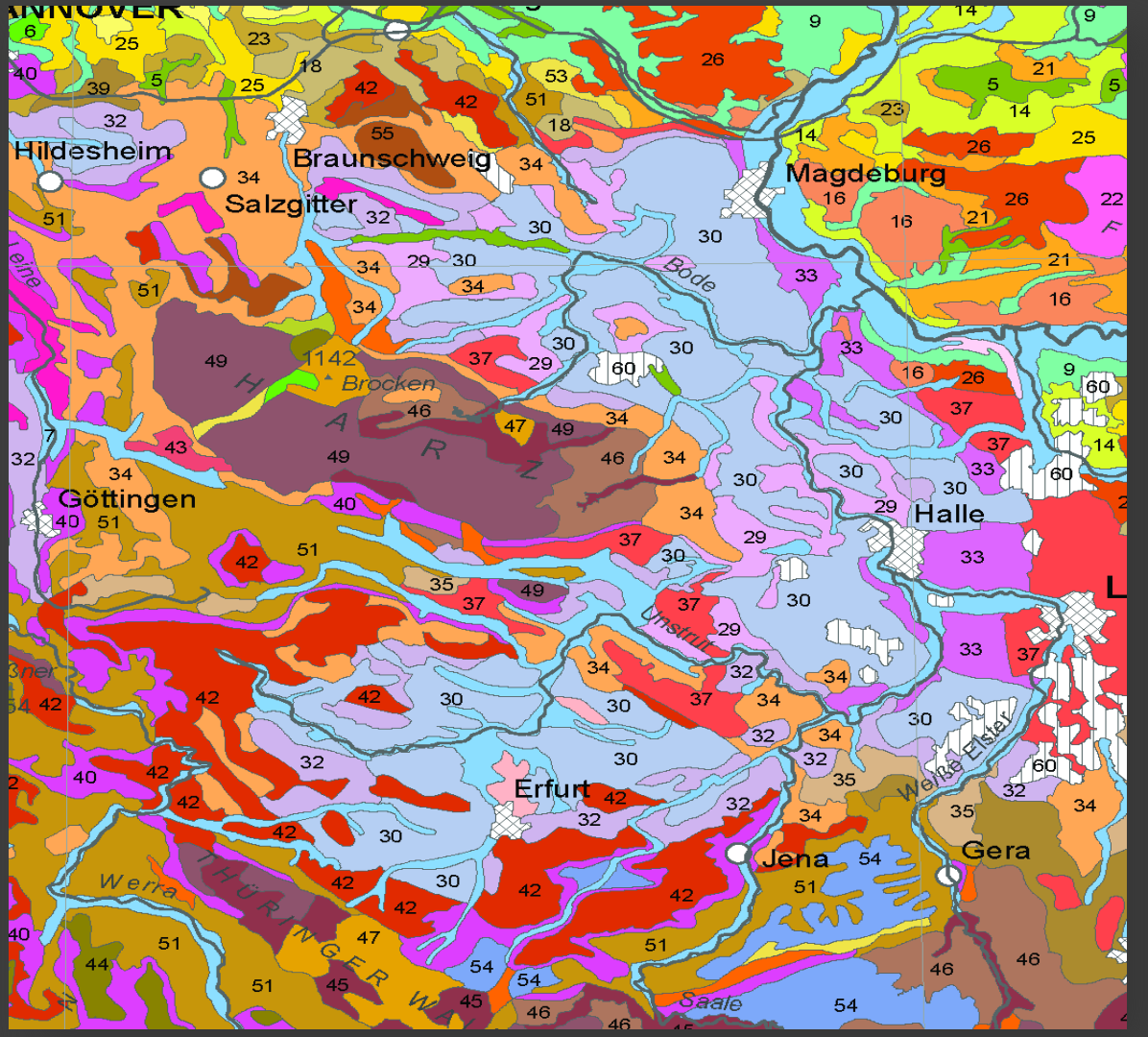
# Product suite for soil monitoring



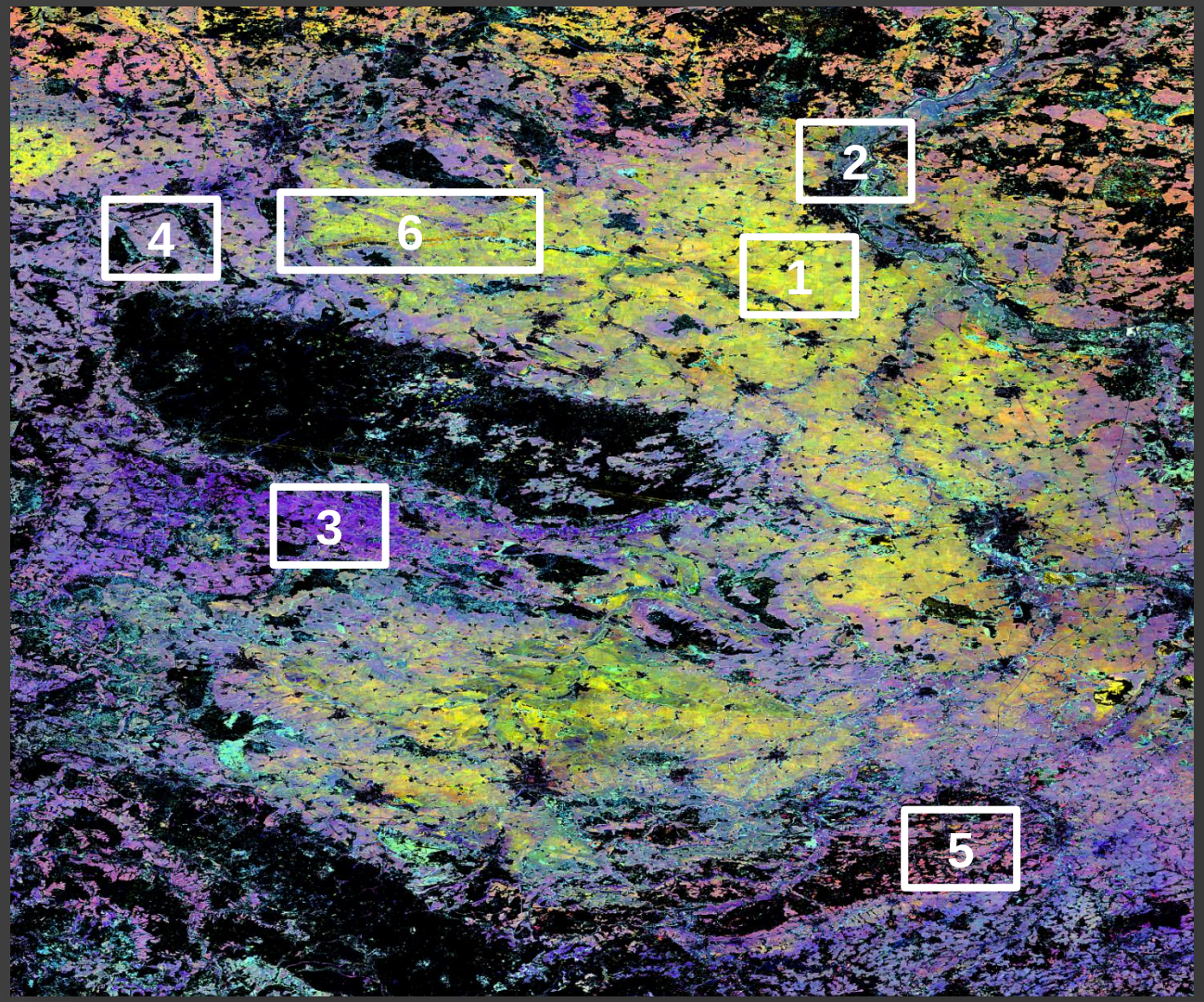
Around Harz Mountains, Germany (RGB Landsat 7-5-3)




BÜK 1000 - Soil Map of Germany

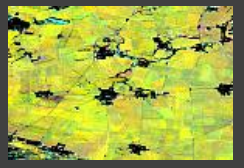
SCMaP

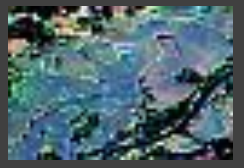
# Product suite for soil monitoring

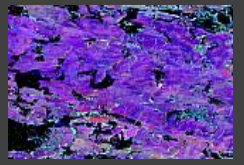


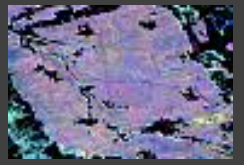

Harz Mountains, Germany

**Soil units World Reference Base (WRB) for Soil Resources: Examples**

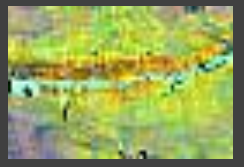
1  Haplic Chernozem (Chha)

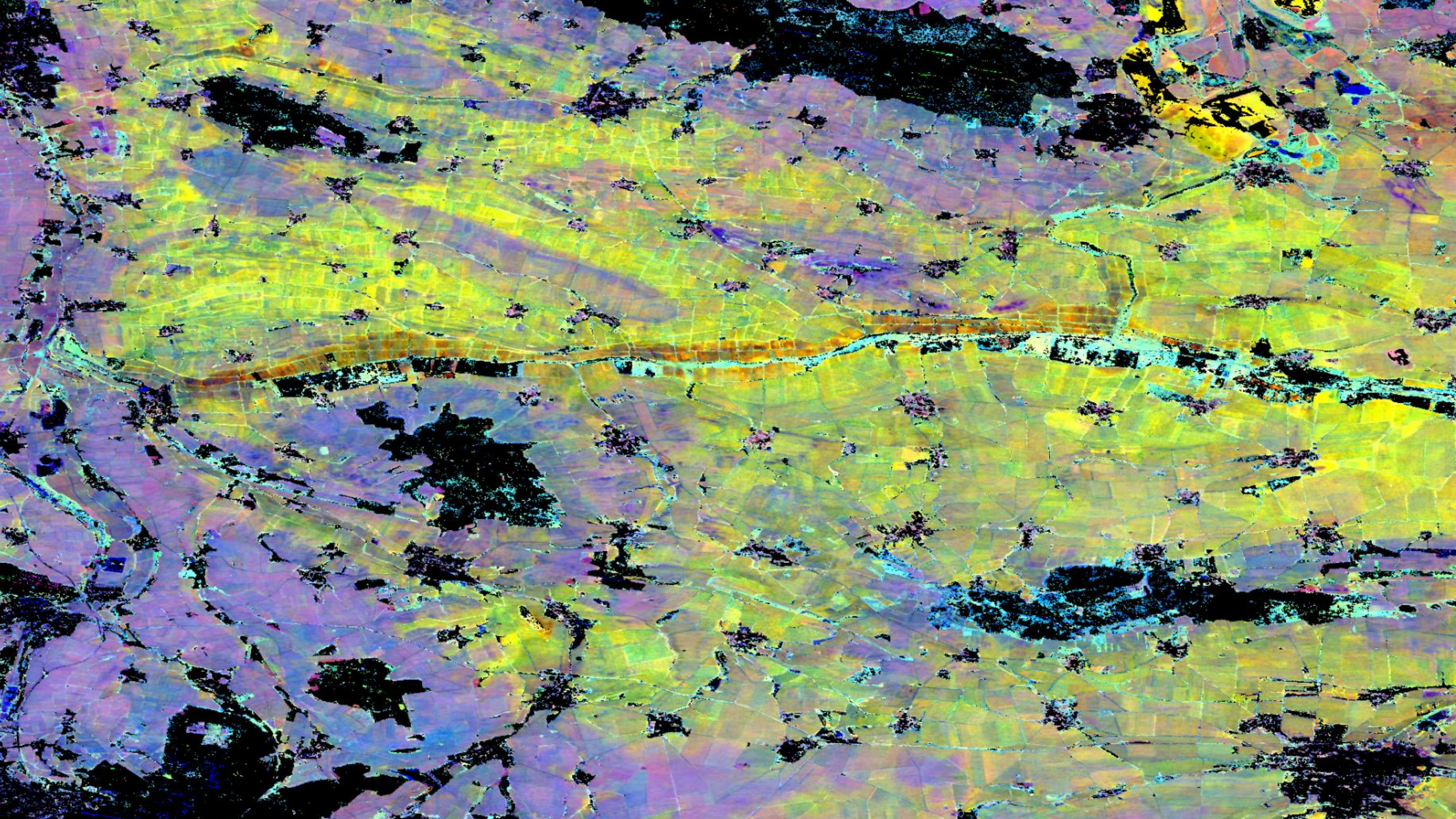
2  Calcaric Cambisol (CMca)

3  Dystric Cambisol (CMdy)

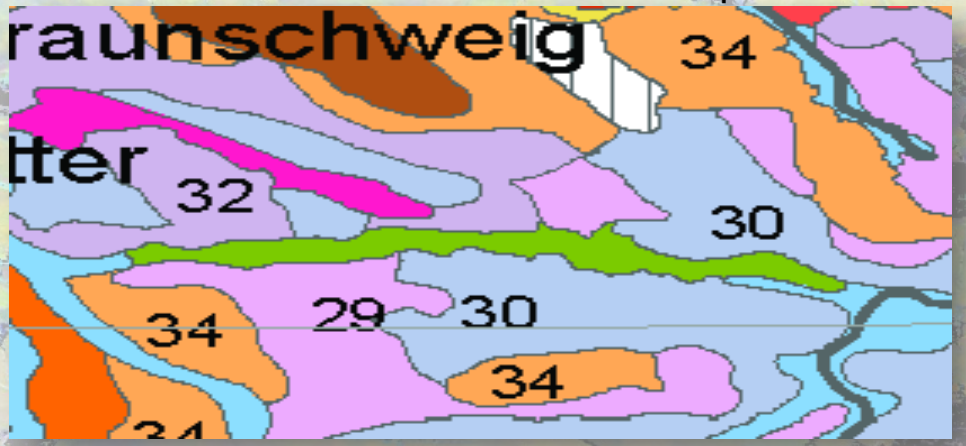
4  Haplic Luvisol (LVha)

5  Dystric Gleysol (GLdy)

6  Eutric Histosol (HSeu)



BÜK 2000 (German Soil Map)



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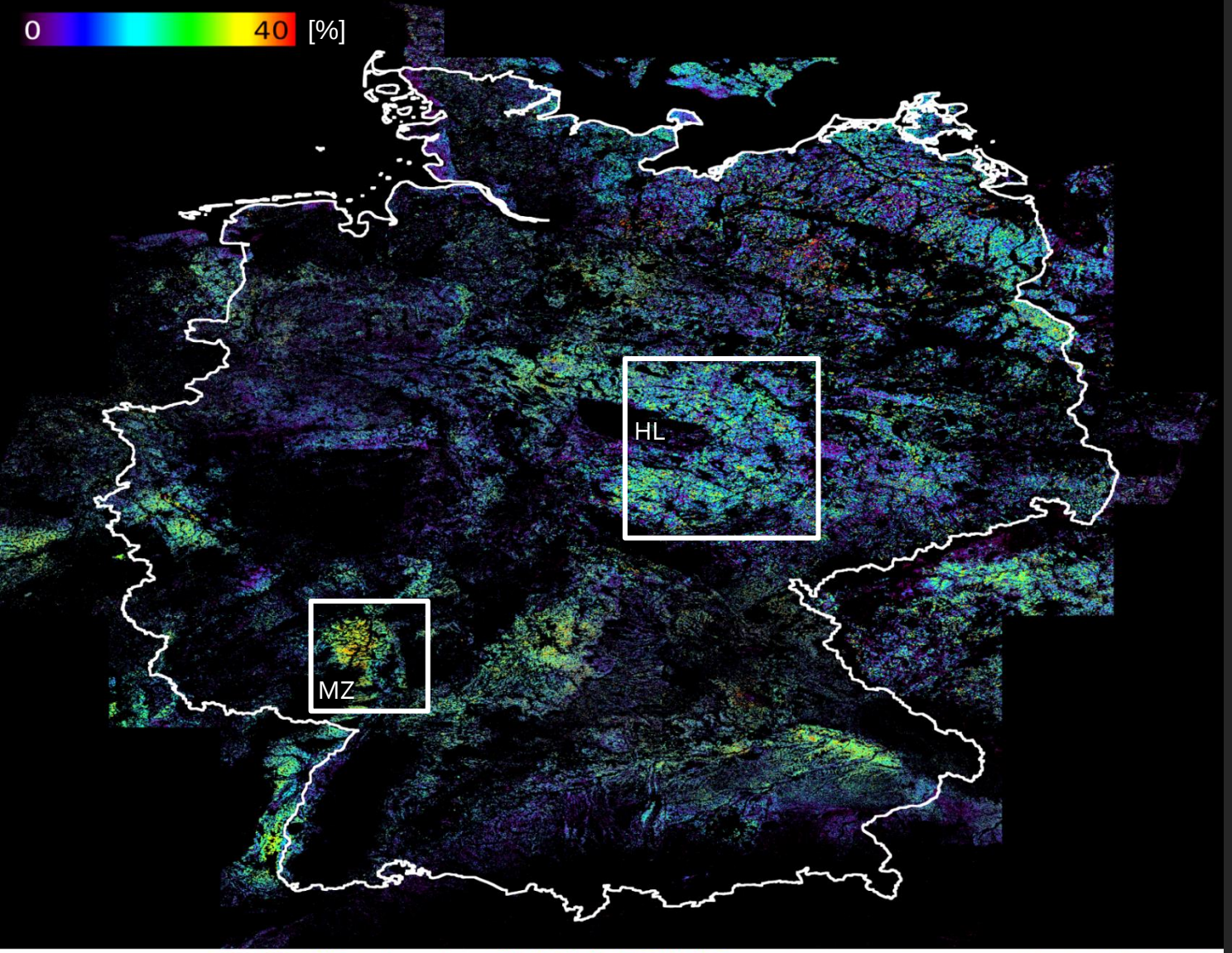
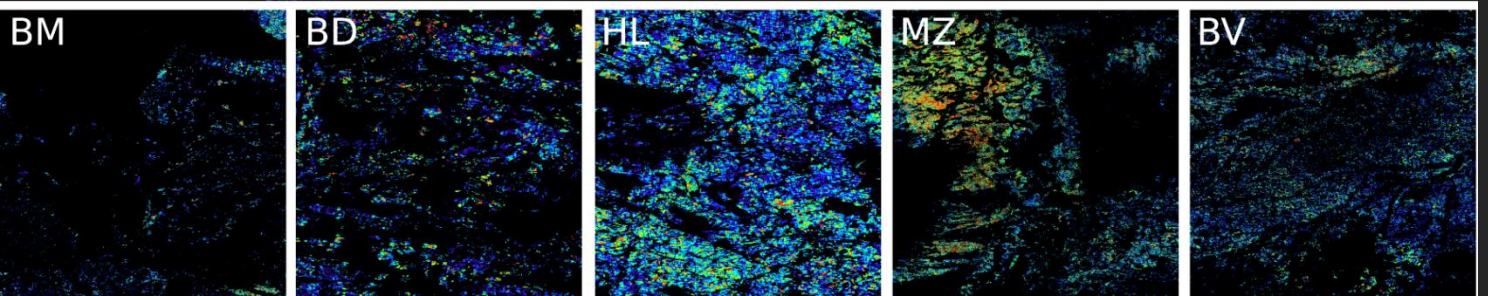
# Product suite for soil monitoring




**Soil Exposure frequency [%]**

- Areas prone to soil erosion

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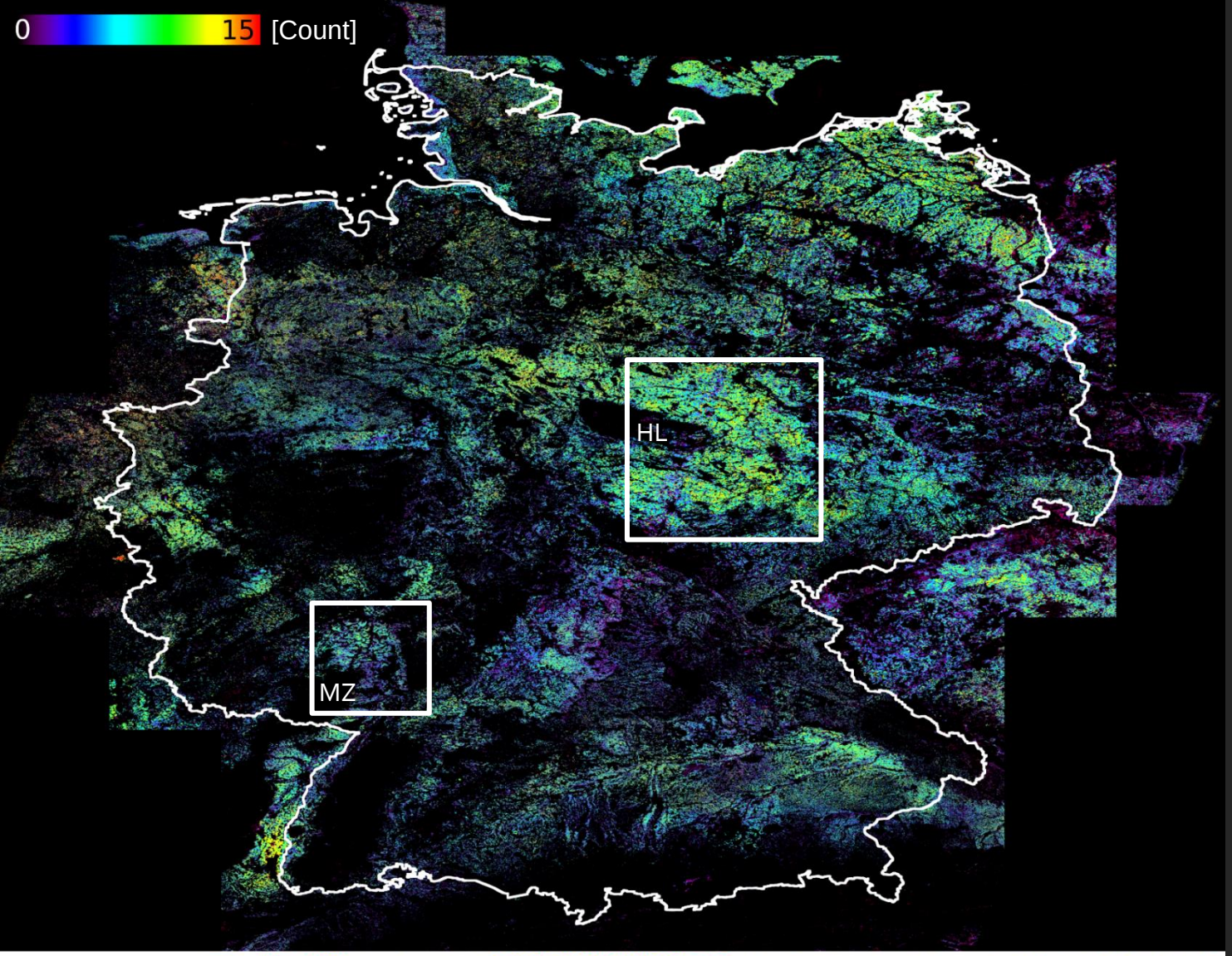
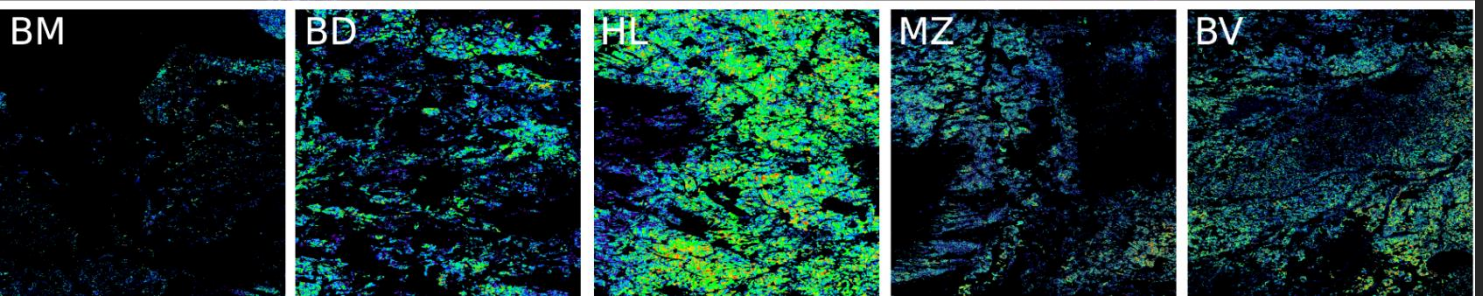
# Product suite for soil monitoring




**Soil Exposure frequency [%]**

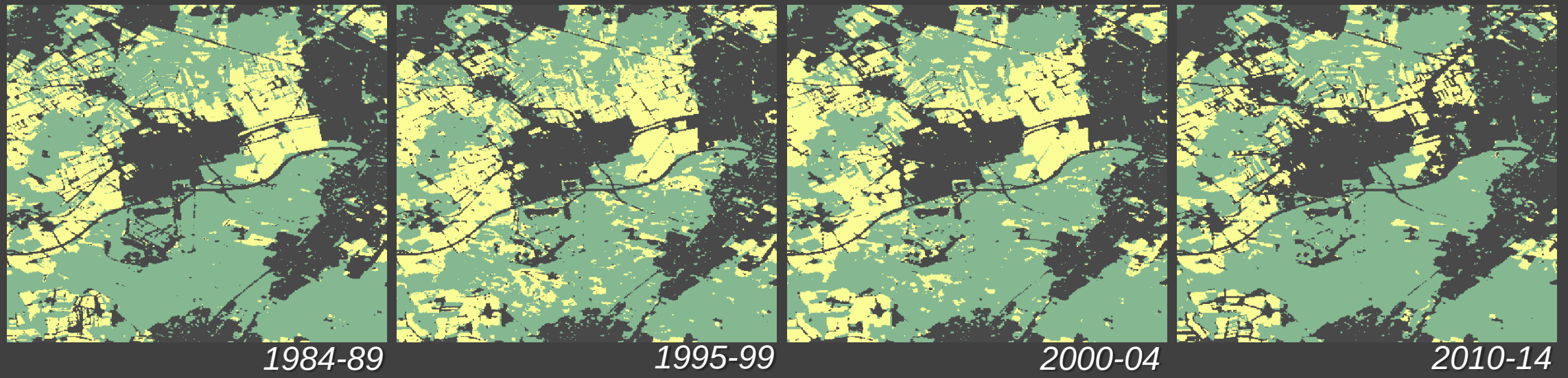
- Areas prone to soil erosion

**Vegetation frequency [Count]**

- Intensity of use

Potential Application

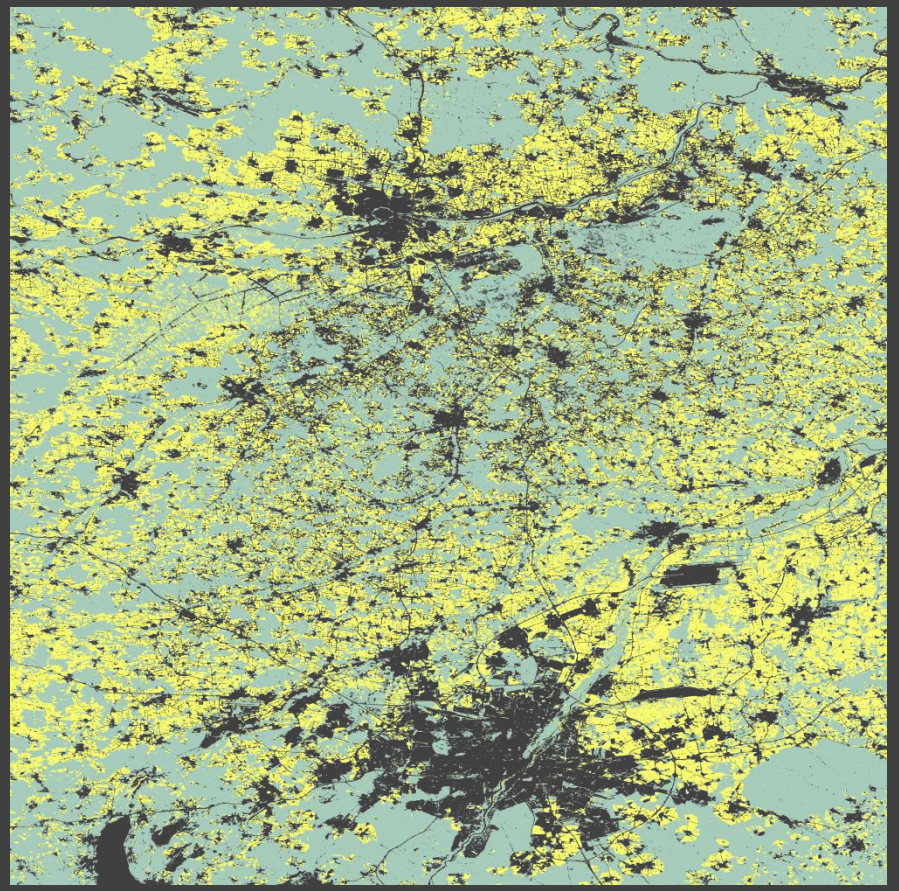
# Exposed soil coverage and simple landcover change


exposed soils | permanent vegetation | permanent non-vegetation

Potential Application

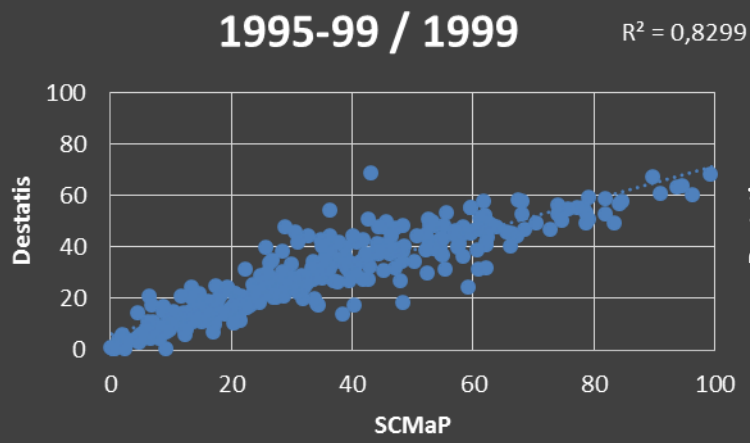
# Exposed soil coverage and simple landcover change - Validation

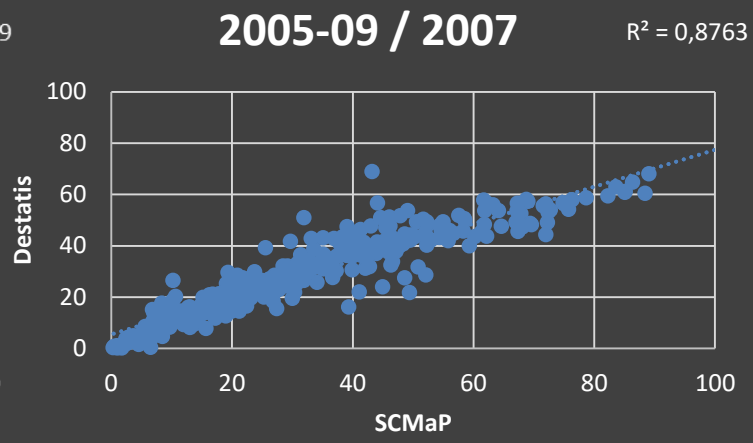


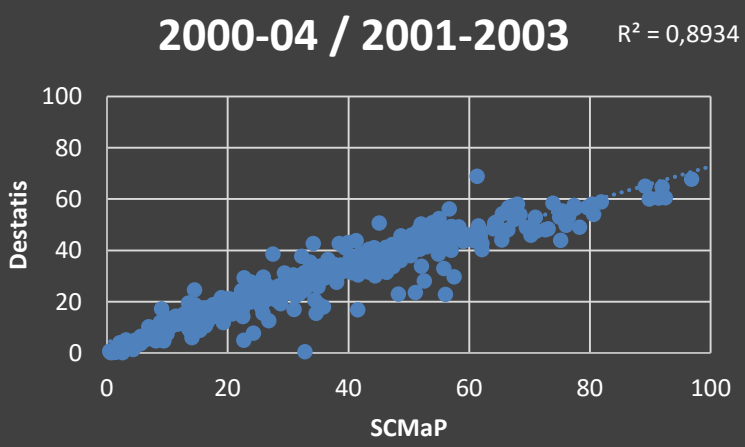
Soil Exposure

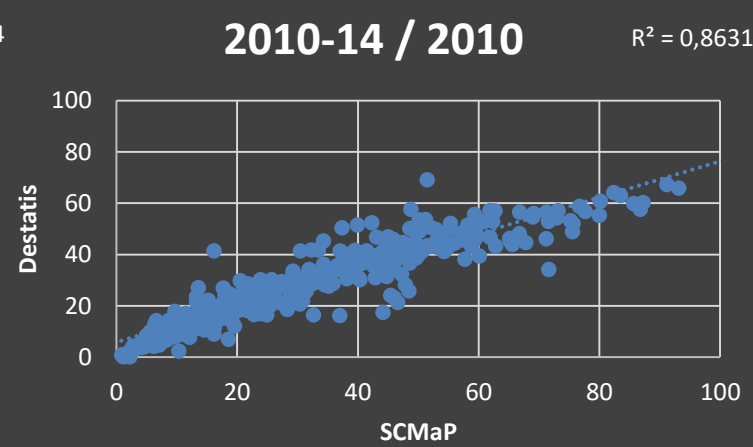
Permanent Non-vegetation

Permanent Vegetation



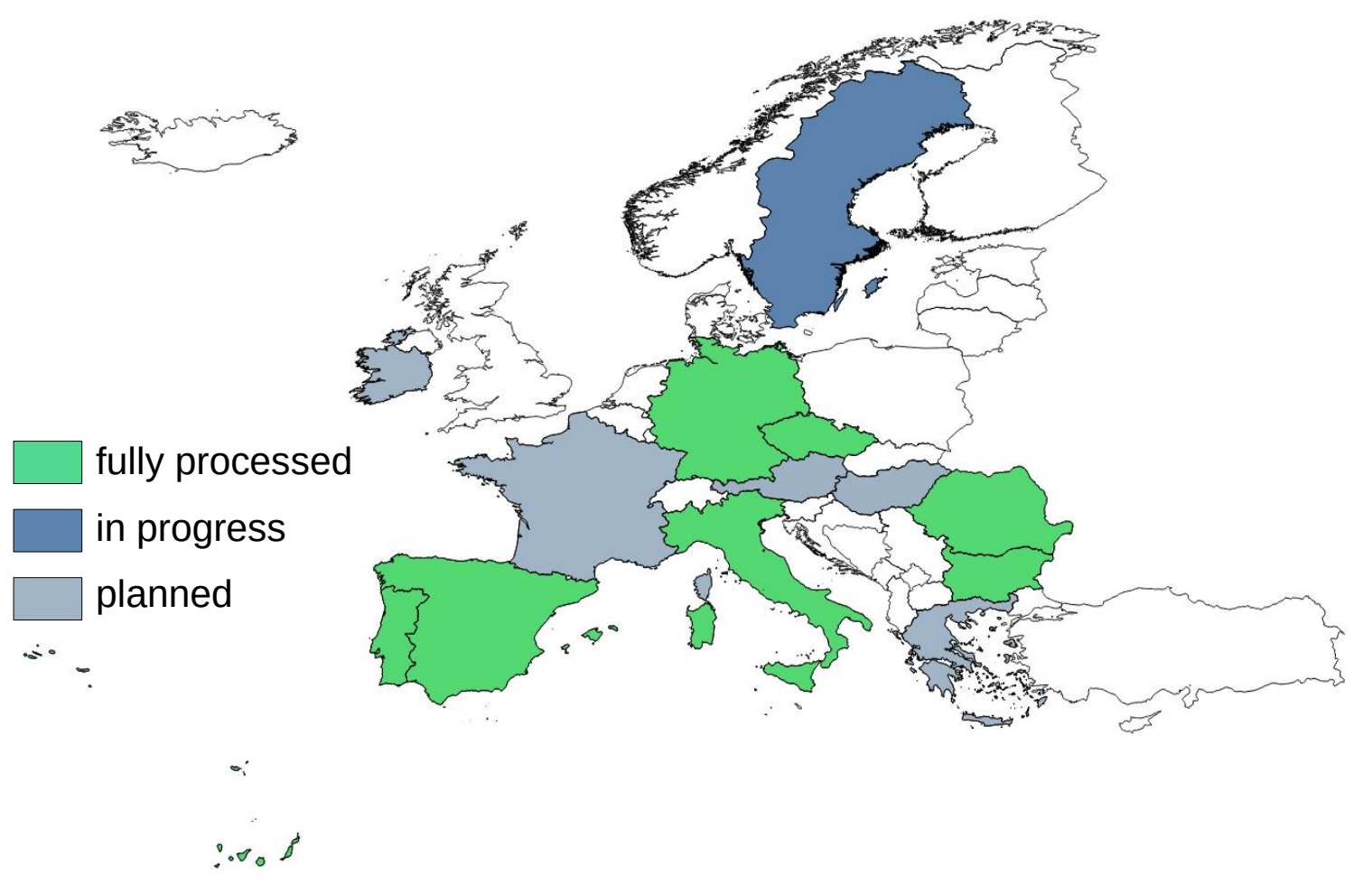




- Statistical Data from DESTATIS (German Federal Statistical Office)
- Exclusion of permanent grassland)
- 1999, 2001, 2003, 2007, 2010
- Comparison on county level

SCMaP

# Current SCMaP processing status




| Country | Downloaded | Pre-processed |
|---|---|---|
| Germany | 20,318 | 11,438 |
| Bulgaria | 5,561 | 5,383 |
| Romania | 9,550 | 8,915 |
| Czech Republic | 3,260 | 2,943 |
| Iberian Peninsula | 18,938 | 18,755 |
| Italy | 16,067 | 12,434 |
| Sweden | 12,453 | proc. |
| Greece | proc. | proc. |
| Ireland | proc. | proc. |
| France | proc. | proc. |

# Thank you for your attention!

**German Aerospace Center (DLR)**

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